UNIVERSITY OF TORONTO
YORK UNIVERSITY

JOINT PROGRAM
IN TRANSPORTATION

ANNUAL REPORT
1982-1983

JULY 1983

RESEARCH SPONSORS

The following organizations have provided grants or sponsored research since the establishment of the Joint Program in Transportation

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Canada, Ministry of Industry, Trade and Commerce

Canada, Ministry of State for Urban Affairs

Canadian National Railways

Canadian Transport Commission

Canadian Urban Transit Association

Dominion Marine Association

Economic Development Institute, World Bank

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The Northern Transportation Company Ltd.

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Ontario Select Committee on Highway Transportation of Goods

Ontario Trucking Association

OTA Education Foundation Inc.

Roads and Transportation Association of Canada

St. Lawrence Seaway Authority

Toronto Transit Commission

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University of Toronto

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VIA Rail Canada Inc.

York University

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YORK UNIVERSITY

JOINT PROGRAM IN TRANSPORTATION

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Strategic Policy Directorate of Transport Canada

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FOREWORD

The Joint Program in Transportation is a cooperative effort of the University of Toronto and York University organized in 1970 in response to a request for proposals by the Canadian Transport Commission for the establishment of a number of regional university research centres. In July 1976, a formal agreement officially established the Joint Program as the agency for the coordination, promotion, and conduct of transportation activities at the two universities.

The principal objectives of the Joint Program are:

- to encourage research relevant to improved transportation in Canada through the influence of research findings on investment planning, policy development, operations, and development of human resources and expertise
- to serve government and the transportation industry as a source of information, expertise and special purpose training programs
- to provide an environment within the two universities that is conducive to high quality teaching and research in the transportation field
- to assist both universities in coordinating teaching programs in the transportation field
- to be self-financing and return a reasonable contribution to university overhead

During 1982-83, the Joint Program completed two major projects. One was on behalf of the Cairo Transport Authority and involved the preparation of a five-year plan for improvements to the surface transportation system; the other was completed for VIA Rail Canada, Inc. concerning alternative strategies for improved passenger service in the Quebec-Windsor corridor. On the basis of the VIA Rail study, research was initiated on the future of rail passenger service in Canada which focuses on institutional barriers to improvements in rail service.

New initiatives were also taken in a number of other areas related to the impact of technological change and deregulation on intermodal competition. During the forthcoming year, research in this area is expected to be enhanced by the presence of a newly appointed Senior Research Fellow highly experienced in the trucking field. Similarly, the appointment of a Research Fellow with experience in Great Lakes shipping and the St. Lawrence Seaway activities is expected to enhance the Joint Program's profile in this area.

During the last year, the base of funding was broadened substantially to include some new sponsors, as well as others from whom financial support had not been received for several years. Many of the new initiatives which resulted in such support were made possible, however, only through the

continued generosity of Transport Canada, whose support is gratefully acknowledged.

In addition, the Joint Program's general research and educational activities have continued in the following three basic areas:

Research - Research is undertaken in response to proposals submitted by faculty members or requests made by external organizations. In some cases, the Director or the Executive Committee also attempt to exert a positive influence on the direction of research activity by establishing research priorities in areas relevant to current Canadian transportation problems and issues.

Funds to support research are generally derived from one of three sources. First, the Joint Program uses a portion of its Transport Canada base grant to support individual faculty members or groups of faculty members who apply. Second, the Joint Program circulates requests for proposals to be submitted to Transport Canada for Negotiated Research Contributions. Joint Program proposals compete with those of ten other Canadian universities for limited funds earmarked for this purpose. Third, the Joint Program is periodically approached by other external private or public organizations to undertake contract research on specific topics. In all three cases, the Joint Program retains the right to publication and requires that the principal investigator(s) produce a final report upon the completion of the research project. There is no obligation for the principal investigator(s) to publish the results in academic journals, although obviously, such publication is encouraged.

Education - The Joint Program has no direct responsibility for teaching programs and does not enrol graduate students. However, assistance is given to individual teaching departments in offering new courses where gaps in the available curricula appear to exist. Periodically, special courses of interest to practitioners in the field are offered. A variety of seminars and conferences are also sponsored.

In addition, the Joint Program provides direct financial assistance to graduate students working on major research papers or theses through a summer student grant program. These awards are made through an annual competition open to students from any discipline. Financial assistance is also provided to graduate students who work as research assistants for individual faculty members. In many cases, this project work is directly related to the student's degree research requirements.

Another important educational activity involves the annual preparation of a brochure that describes the complete range of transportation and transportation-related courses offered within the two universities. The current edition of the course list, for example, shows 192 course offerings in a wide range of teaching departments. Through the efforts of the Joint Program, mechanisms for allowing students to cross-register among departments and between the universities have been greatly facilitated.

While the Joint Program has no formal teaching responsibilities, externally the Program serves as a focus of interest for potential new students who often make their first contact with the Joint Program and who are subsequently directed to the appropriate graduate teaching departments.

Publications - One of the major activities of the Joint Program involves the dissemination of research results through the various publication series. Research Reports are refereed and constitute the major academic publications of the Joint Program. Other publications include working papers, special conference proceedings, and major transportation papers or monographs. In addition, a quarterly newsletter is published which serves as a comprehensive source of information on conferences, seminars, and ongoing research in Canada.

R. M. Soberman
Director

ORGANIZATION AND ADMINISTRATION

The management of the Joint Program is responsible for the allocation of general program funds for research support and administrative services, the generation of research proposals consistent with the objectives of the Program, and the identification of educational opportunities and needs both within and outside the university community.

Organizational Structure

To execute these responsibilities, the organizational structure of the Joint Program in Transportation is composed of three separate groups:

- the Council
- the Executive
- the Board of Advisors

The Council acts on behalf of the administrations of the University of Toronto and York University to ensure concurrence of the activities of the Joint Program with the terms of the formal agreement authorizing its establishment and with general university policies and procedures.

The Executive Committee consists of the Director of the Joint Program in Transportation and three faculty members from each university appointed by the Council. The Director is responsible for the administration of the Joint Program and also serves as Chairman of the Executive Committee.

The Board of Advisors, which consists of members appointed by the Council from the academic, government and business communities, provides advice on an individual basis as solicited by the Council or the Executive Committee.

In addition, support services are provided on the two campuses by an administrative assistant, an editor and secretarial staff. An office is maintained on each university campus.

Faculty Associates

There are no formal requirements for membership in the Joint Program and all faculty and graduate students in transport-related fields are welcome to participate in the various research and educational activities. Since its inception, a large number of faculty at both universities have obtained research support through the Joint Program. Faculty members involved in transport research and teaching in the two universities include the following:

University of Toronto

Aerospace Studies
- J.D. DeLaurier

Civil Engineering
- P.H. Byer
- M.M. Davis
- E. Hauer
- V. F. Hurdle
- P. Jones
- E. J. Miller
- R. M. Soberman
- G. N. Steuart

Chemical Engineering
- D. Mackay

Industrial Engineering
- M.J.M. Posner
- I. B. Turksen

Management Studies
- G.S. Day
- J.E. Dooley
- L. Fertuck
- G.H. Haines
- R. N. Wolff
- S. P. Sethi

Mechanical Engineering
- R. G. Fenton

Economics
- A. Abouchar
- D.N. Dewees
- D. M. Nowlan

Sociology
- B. Wellman

York University

Administrative Studies
- S.F. Borins
- W.D. Cook
- D. Horvath
- W.A. Jordan
- T.E. Kuhn
- I. Litvak
- C.J. McMillan
- K.J. Radford
- G.C. Shaw
- S.L. Warner
- U. Zohar

Economics
- J.B. Beare
- R. K. House

Political Science
- D.V.J. Bell
- E.J. Dosman
- F. Fletcher
- H. Kaplan

Psychology
- P. Stager

Environmental Studies
- G.A.P. Carrothers
- T.J. Cartwright
- M. Chevalier
- A. Cubukgil
- G.L. Desfor
- R.G. Macdonald
- R. M. Soberman
- P. F. Wilkinson

Geography
- R. Bordessa
- W.C. Found
- D.B. Freeman
- B.H. Massam
- N.M. McArthur
- H.R. Merrens
- G.B. Norcliffe
- R.I. Wolfe

Social Science
- F. Frisken

Sociology
- A. Turrittin

FUNDING

The Joint Program receives financial support from three sources:

- A general program grant provided by the Strategic Policy Directorate of Transport Canada
- Contract research
- Direct financial assistance from the University of Toronto and York University

From these sources, faculty and graduate student research is supported in two ways. First, a portion of the Transport Canada general program grant is allocated for the support of individual faculty research projects, awarded directly by the Joint Program. Student grants are also awarded from these funds. Both the individual faculty grants and the student grants are made following a general call for proposals and subsequent evaluation by a special review committee appointed by the Executive Committee.

Second, the Joint Program assists individual faculty members or groups of faculty in preparing proposals for contract research from outside sponsors. One of the principal sources of contract research to date is a special Transport Canada Negotiated Research Fund, established to support research that addresses significant issues in Canadian transportation. The Joint Program competes with other selected Canadian universities for awards from this fund. Proposals for these Negotiated Research Grants are submitted in December of each year.

In addition, contract research is sponsored by other federal, provincial and municipal governments and agencies such as the Ontario Ministry of Transportation and Communications, the Toronto Transit Commission, VIA Rail Canada Inc., and the Urban Transportation Development Corporation.

Funds available from either internal program grants or external contract research are used to cover the costs of faculty release time, summer supplements, research assistants, travel, clerical assistance, computer time, and other supplies and services according to general guidelines established by the research administrations at each university.

During the fiscal year ending April 1983, the Joint Program in Transportation received research support from the following organizations:

Canadian Urban Transit Association

Energy Mines and Resources Canada

Roads and Transportation Association of Canada

Transport Canada Strategic Policy Directorate

Transport Canada Transportation Development Centre

University of Toronto
Urban Transportation Development Corporation
VIA Rail Canada, Inc.
York University

Total revenue from these sources amounted to $475,000 for 1982-83.

RESEARCH IN PROGRESS

This section describes current research in progress during the period 1 July 1982 to 30 June 1983. The first group covers faculty research supported through internal program grants or contract research. The second group identifies student research supported directly by the Joint Program.

GRANTS TO FACULTY MEMBERS

In progress as of July 1, 1982

Cairo Transport Authority* In cooperation with the Urban Transportation Development Corporation, the Canadian International Development Agency and the World Bank, the Joint Program in Transportation has been retained to provide advisory services to the Cairo Transport Authority regarding the preparation of a five-year investment plan. This plan is aimed at improving the level of service for the existing system and developing preliminary plans and concepts for expansion over a five- to ten-year period to serve a number of emerging growth centres within the Cairo metropolitan region. While there have been innumerable studies of urban transportation problems within and around Cairo over the last decade, the principal focus of the current review is to prepare an implementation plan that is sensitive to both the fiscal and human resources that are likely to be available over the coming five-year period.
Sponsor: Urban Transportation Development Corporation

A. Cubukgil, S.M. Houghton-Fenton, E.J. Miller, R. Ridout, R.M. Soberman, G.N. Steuart, and R.A. Wolfe, Joint Program in Transportation.

Rail Passenger Corridor Study* VIA Rail Canada Inc., the Crown corporation responsible for rail passenger services in Canada has undertaken an assessment of various improvements to rail passenger services in the highly populated Quebec-Windsor corridor. As a component of this overall assessment of improved services, the Joint Program in Transportation was retained to assist VIA Rail in assessing a variety of external impacts associated with various levels of service.

The Joint Program's responsibility related to the development of an overall work plan and the coordination and integration of a number of separate sub-studies concerned with such external impacts as energy conservation, industrial and manufacturing activity, regional development and tourism, safety, environmental impacts, and possible effects of improved rail service on government expenditures for other modes of intercity passenger transportation.
Sponsor: VIA Rail Canada Inc.

A. Cubukgil, E.J. Miller, R. Ridout, R.M. Soberman, G.N. Steuart, and R.A. Wolfe, Joint Program in Transportation.

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*Indicates completion.

Energy Consumption of Alternative Transport Modes The energy efficiency of a given mode of transport depends upon the physical characteristics of the technology employed, the service characteristics within which it is operated, and the spatial distribution of socio-economic activities which determine the demand for the service. The proposed research focuses upon the first two of these aspects. Drawing upon theoretical understanding of modal fuel consumption relationships and data from operating systems, simple, policy-sensitive models of fuel consumption by mode will be developed for use in the assessment of the efficiency of the different transport modes within various demand contexts.
Sponsor: Transport Canada

E.J. Miller and R.M. Soberman, Joint Program in Transportation

Collective Bargaining in the Canadian Transport Sector: A Multi-Modal Overview The objectives of this research project are to develop a conceptual framework for the study of collective bargaining in the transport sector and then to apply this framework to the air, rail, and marine modes, with special emphasis on airline pilots, air traffic controllers, railway workers, and ports workers (longshoremen and others). Particular interest is devoted to:

- monitoring conflict levels in the various modes, measured in terms of a conflict-interaction model
- identifying over time and across modes the major issues that arise in negotiating collective agreements
- comparing and evaluating outcomes of collective bargaining
- assessing governmental dispute settlement techniques intended to improve labour relations, particularly since 1976
- describing the changing profile of the work force in the various modes, especially in light of different assumptions about growth and industrial change.

Sponsor: Transport Canada

D.V.J. Bell and E.J. Dosman, Department of Political Science, York University

Network Pricing and Scheduling for Estimating Transport Demand Functions The impact of current pricing and scheduling decisions in terms of their potential for improving future decisions is an essential input to long term optimal price/schedule planning for a transportation network. This study proposes to consider the consequences of various pricing/scheduling changes for information purposes. A model will be developed, computerized and tested for obtaining improved estimates of transportation demand functions

based on price and schedule considerations. The model should be of relevance for a wide variety of urban, national and international transportation systems.
Sponsor: Transport Canada

W.D. Cook, G.C. Shaw and S.L. Warner, Faculty of Administrative Studies, York University.

An Investigation of Airship Survivability in Atmospheric Turbulence and Extreme Manoeuvres The purpose of this work is to quantitatively assess the survivability of modern airships in atmospheric turbulence, including storm conditions. This will be accomplished with a non-linear flight-dynamic simulation which gives the airship's motion response and structural loads for specified control and turbulence inputs. The simulation will be applied to certain proposed modern airships, and the results will show their margins of safety, and how these are influenced by their relative design characteristics. From these, conclusions will be reached on the safety and desirable design directions for modern airships; and this work will provide an analytical method for the evaluation of such designs.
Sponsor: Transport Canada

J.D. DeLaurier, Institute for Aerospace Studies, University of Toronto

Labour Relations in the Canadian Urban Transit Industry The aim of this project is to prepare a comprehensive analysis of labour relations in the Canadian urban transit industry. The research is primarily devoted to a series of case studies investigating labour relations in selected urban transit systems across the country. The data collected in the course of these case studies will then provide the basis for examining a number of current issues in transit labour relations: the use of part-time labour, work-sharing, technological change, the impact of different institutional structures on collective bargaining, and the inter-relationships between labour relations and other aspects of transit operations.
Sponsor: Joint Program in Transportation and Transport Canada (as of April 1981)

E.J. Dosman, Department of Political Science, York University, and D.F. Campbell, Graduate Student, Department of Urban and Regional Planning, University of Toronto

A Safety Estimation Tool The number of accidents occurring on a system (city, region, province, country) is the outcome of a complex interaction of many causal factors. Among the more important factors are driver and pedestrian demography, weather, quantity and quality of exposure, the fleet of vehicles and the like. The objective of the proposed research is to create an estimation tool which, when fed information about the aforementioned causal factors, will produce estimates of the number of accidents, classified by severity, expected on the system. It will also be capable of producing a measure of the uncertainty of estimation. Such a tool would be used:

1) To interpret and explain observed changes in system safety
2) To judge the effects of countermeasures
3) To estimate safety futures.

Sponsor: Transport Canada

E. Hauer, Department of Civil Engineering, University of Toronto

The Light-Rapid Comfortable LRC Train and the Intermediate Capacity Transit System (ICTS)* (Two Case Studies of Innovation in the Urban Transportation Equipment Manufacturing Industry) The process of innovation in the urban transportation equipment manufacturing industry in Canada is examined in the context of two case studies, which provide a historical reconstruction of the developments leading to the Light Rapid and Comfortable (LRC) train and the Intermediate Capacity Transit System (ICTS). Special attention is drawn to the role of federal, provincial and municipal governments, the establishment of consortia of firms from the public and private sectors, and the need to develop a systems approach to successful innovation in the field of urban transportation. The study also provides an overview of the urban transportation equipment industry in Canada as a background to the two case studies.

Sponsor: Transport Canada

I.A. Litvak, Faculty of Administrative Studies, York University and C. J. Maule, Department of Economics and the School of International Affairs, Carleton University

Problems of Comparing Rural Public Transport Policies in Saskatchewan Using a Concordance Analysis and Multi-Dimension Scaling Procedure* This report examines the use of a formal procedure - concordance analysis and multi-dimension scaling - for comparing alternate policies to solve a transport problem in Saskatchewan. The specific problem was to select a public transport system to serve small rural communities. The data used in the study are contained within the Saskatchewan Rural Public Transportation Policy Review (1978). Six alternate policy options were defined; each refers to a size category of rural communities that could be served. The categories were communities with populations >100, >150, >200, >300, > 400, and > 500. For each policy, three administrative options and four cost criteria were provided. Experiments were conducted to provide classifications of the policy options to determine the relative attractiveness of each policy. The analysis suggests that the most appropriate policy is to serve communities with populations of at least 300. This appears to be the most cost-effective option. Comments on the data requirements of the procedure are included. The appendix gives details of a theoretical approach for determining the relative importance of criteria for use in concordance analysis.

Sponsor: Transport Canada

B.H. Massam, Dean of Research and Professor in the Department of Geography and Urban Studies Program (Division of Social Science), York University, and I. Askew, Institute of Population Studies, University of Exeter.

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*Indicates completion.

Investigation of Supply Interactions in Transport Demand Modelling The use of random utility choice models in the field of transport demand modelling has expanded considerably over the past two decades. One issue, however, which has been largely ignored in the development of these models, is the extent to which the supply side of the transport system demand-supply interaction must be considered in order to correctly specify and identify the demand function. Ignoring such interactions creates at least the potential for significant biases in model estimations and, hence, in the predictions generated from these models. The purpose of the proposed research is to investigate the extent to which supply interactions must be considered in the construction of travel demand models. This investigation will include: development of a consistent theoretical framework for analysis; identification of major problem areas associated with the modelling of demand-supply interactions; resolution of statistical estimation and data requirement issues associated with these problem areas; and the detailed theoretical and empirical analysis of the identified major problem areas. The ultimate objective of this research is the development of an improved set of travel demand models that are capable of better meeting the analytical requirements of transportation planners.
Sponsor: Natural Sciences and Engineering Research Council of Canada, University Research Fellowship

E.J. Miller, Joint Program in Transportation

Intercity Passenger Travel - A Behavioural Study The project represents an attempt to rethink current approaches to intercity travel demand modelling, beginning at a very fundamental, explicitly behavioural, level. Key behavioural issues involved in such an approach include: obtaining a clear understanding of the travel markets which exist within the intercity transport systems; obtaining a clear understanding of the decision processes at work within each of these markets; and working at a level of analysis that is sufficiently disaggregate to enable one to hypothesize and test "causal" factors and inter-relationships. The major objectives of the proposed research are: to develop a coherent, consistent theory of intercity passenger travel behaviour; to assess techniques and data currently available to operationalize this theory into practical planning models; and to undertake a limited number of pilot studies in order to test the data collection procedures proposed and to provide preliminary tests of the travel behaviour theory developed.
Sponsor: Transport Canada

E.J. Miller and R.A. Wolfe, Joint Program in Transportation

Disaggregate Modelling of Canadian Vehicle Ownership, Trip-Making and Fuel Usage: Phase I* This research involved the development of a coordinated set of models describing household automobile ownership decisions and their subsequent trip-making behaviour. Data obtained from a nationwide survey of Canadian households provided the basis for the development and

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*Indicates completion.

calibration of the models. The first phase of the project, completed in April 1983, involved the theoretical development of the models, the design and execution of the survey, an exploratory analysis of the survey data, and the development of the first version of the models.
Sponsor: Energy, Mines, and Resources Canada.

E.J. Miller, R.A. Wolfe, Joint Program in Transportation and M.K. Berkowitz, N. Gallini, Institute for Policy Analysis, University of Toronto

The Role of Negotiation in the Formulation and Implementation of Policy This project is designed to investigate the nature of the policy-making process as it exists, and as it might be modified in multi-participant situations. In such situations, policy is not usually satisfactorily established by one participant alone. Stable policies are formulated after a period of negotiation with participants that have the power to influence the outcome of initiations taken by others. The project consists of descriptive studies of past multiple-participant transportation policy situations and some prescriptive work on current situations of that nature.
Sponsor: Transport Canada

K.J. Radford, Faculty of Administrative Studies, Atkinson College, York University

The Analysis of Conflict Over the Location of Airports near Major Population Centers* This project describes a number of controversies which arose over the location of airports near major population centers in terms of a recently suggested model of conflict resolution. Based on the results of these comparative case studies, a general model is derived to provide prescriptions for some of the concerned parties and for a more efficient resolution process. Recommendations are given against the background of Canadian concerns over power-sharing between provincial governments and the federal government and of the continuing "westward shift" of economic activities in Canada.
Sponsor: Transport Canada

K.J. Radford, Faculty of Administrative Studies, York University

Development of an Intercity Transportation Model for Educational Use The student of transportation planning is able to understand the planning process, its inputs, and possible outputs much better if presented with an opportunity to work through the entire process with a realistic but manageable numerical example. The method which is selected to accomplish this objective is one which has been proven in earlier attempts and involves the development of a computer-based package which requires the student to conduct a simulated survey, calibrate a demand model, specify a supply

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*Indicates completion.

model that includes an addition to the hypothetical system, establish transport flows at a supply-demand equilibrium and study the performance measures that result.
Sponsor: Transport Canada

R.G. Rice and G.N. Steuart, Department of Civil Engineering, University of Toronto.

Energy Efficiency in Transport Recent concerns about energy shortages have focused on transportation as one of the primary users of fuels in North America. Concern about inefficient use of energy has resulted in a number of important policy directions by national and provincial governments. Such policies, which are based on assumptions about the relative efficiency of different modes of transportation, may be subject to considerable scrutiny simply because energy efficiency is not merely a function of the physical characteristics of a particular technology. The utilization of that technology, as dictated by demand patterns, can and does have a significant influence on the energy budget.

The research is designed to determine the conditions under which various modes of transportation perform more efficiently from the standpoint of energy consumption and to use the findings as a more substantive basis for indicating appropriate policy direction.

The procedure will first analyze the energy requirements of different modes of transportation from first principles. Second, the conditions which influence the utilization of different modes of transportation (including demand patterns and spatial structure) will be studied to assess the comparative performance of different modes under a variety of spatial and economic conditions. The third part of the research will deal with alternative policy directions for achieving greater energy efficiency in the transport sector.
Sponsor: Natural Sciences and Engineering Research Council of Canada

R.M. Soberman, Joint Program in Transportation

The Journey to Community This project examines the interrelationship of contemporary Ontario community life with travel and communications behaviour.

Recent sociological research indicates that many important community ties extend well beyond the neighbourhood, and that social services and support often come from non-local sources. Such technological developments as the automobile, transit and the telephone--in conjunction with the large-scale effects of bureaucratization, capitalism, industrialization and urbanization--have decreased the role of the neighbourhood as the basis for contemporary Canadian community life. In place of local, solidary communities, Canadians are now more apt to have differentiated, multiple communities which are quite dispersed in space.

Such dispersed communities are closely related to travel behaviour. However, travel behaviour studies to date have concentrated on the journey

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*Indicates completion.

to work, the source of most peak demand, while studies of nonwork travel have focused on leisure and shopping. This study will:

1) examine the impact which such spatially dispersed communities have on travel and communications behaviour;
2) compare the functioning of communities maintained at the local neighbourhood level (pedestrian or short trip), maintained at the metropolitan level (automobile, telecommunications, transit), or maintained at long distances (telecommunications, airplane, automobile).

Sponsor: Joint Program in Transportation

B. Wellman, Department of Sociology, University of Toronto

Awarded in the Period 1 July 1982 to 30 June 1983

Truck/Rail Competition in Canada: An Assessment of Technological and Regulatory Changes in the Truck Industry One of the key issues facing railways today is the impact of changes in motor carrier technology and regulation on truck/rail competition in major corridors. Essentially, the railway industry is concerned with maintaining and, if possible, improving its market position vis-à-vis the position of competing motor carriers.

The purpose of this study is to identify changes in truck technology and regulation which are likely to occur over the next ten years and to assess their impact on trucking costs. A comprehensive 3-phase framework has been developed to accommodate this objective. The first phase is designed to examine anticipated changes in truck technology over the next ten years and to assess the impact of these changes on motor carrier operations and costs. Given the scope of technological changes over the next decade, a selective approach must be used to evaluate their impacts on rail/truck competition. Therefore, a scenario framework has been adopted whereby a number of scenarios will be developed using the findings of the preceding examination.

Phase two is aimed at investigating the nature and timing of forthcoming changes in truck regulation which are likely to occur over the next decade. Efforts will also be directed at examining the effect of these changes on truck operations and costs, and developing appropriate scenarios on the basis of this examination.

Finally, phase three is directed at assessing the impacts of technological and regulatory change specified in the preceding scenarios on the cost structure of the trucking industry and quantifying the effects of these changes on average unit costs for selected case study routes/corridor. Essentially, the CN Cost Truck Model will be used to generate and project motor carrier unit costs over the next ten years. The average unit costs

associated with current technology and those estimates obtained for given changes in truck technologies will then be compared and evaluated.
Sponsor: Canadian National Railways

Adil Cubukgil, Stephen Flott, Susan Houghton-Fenton, Rowena Ridout, and David Ross, Joint Program in Transportation; Alan Clayton, University of Manitoba and Fred Nix, R.K. House & Associates.

Pricing Strategies for St. Lawrence Seaway/Welland Canal: An Economic Analysis of User Charges The purpose of this study is to examine the key issues involving user charges on the Great Lakes-Seaway system and to address these from an economic standpoint. Essentially, the current pricing strategy of the Seaway Authority will be examined with respect to its economic efficiency and, based on this analysis, alternate strategies will be developed and assessed. Specifically, efforts will be directed at:

- analyzing major Seaway traffic flows and their origin/destination patterns using CIGGT freight data;
- analyzing current user charges in relation to delivery values and transportation costs;
- investigating the characteristics of competing routes/modes;
- assessing the financial position of the Seaway Authority;
- analyzing the cost structure of the Seaway Authority;
- developing alternative cost-based pricing schemes;
- assessing the impact of these pricing schemes on the commercial viability of the Seaway Authority, the Great Lakes shipping industry, and Seaway/Welland Canal traffic.

Sponsor: Transport Canada

Adil Cubukgil and Susan Houghton-Fenton, Joint Program in Transportation; Sandford Borins, Faculty of Administrative Studies, York University.

Policy Implications on TOFC/COFC and Motor Carrier Competition: An Analysis of Private and Public Costs Over the years, public subsidies to transportation have been directly and indirectly allocated to various modes in differential amounts. Although these subsidies were initially designed to stimulate development and efficiency, more often than not subsidies have distorted the relative cost advantages of various modes that would not have occurred had economic criteria prevailed. Not only are cost structures and levels affected, but the cost behaviour and quality of service of various modes are influenced as well.

The purpose of this study is to review recent studies of highway finance, and examine cost-revenue comparisons under alternative assumptions concerning definition of revenues and allocation of costs. The implications of alternative cost recovery scenarios for truck-rail competition will be examined. The study will then draw comparisons between the two modes from the standpoint of public costs.
Sponsor: Transport Canada

Adil Cubukgil, Joint Program in Transportation

An Experimental Study of Hull/Rotor Interference on Heavy-Lift Airships The purpose of this research is to obtain a quantitative measure of the aerodynamic interference between the hull and lifting rotors of a heavy-lift airship. This will be accomplished by wind-tunnel testing models of representative configurations, and varying key parameters such as rotor power, yaw angle, and height from the groundboard. Results will include the variations in rotor thrust and hull-pressure distribution near the rotors. From these, values for hull/rotor-interference coefficients will be obtained. These may be used, in conjunction with a flight-dynamics analysis, to identify potential stability and control problems.
Sponsor: Transport Canada

James D. DeLaurier, Institute for Aerospace Studies, University of Toronto.

Safety and Mobility on Public Roads as a Consequence of Winter Road Maintenance Provincial and municipal governments throughout Canada (and elsewhere) spend vast sums of money each winter to remove snow and ice from streets, roads, and highways. This is done primarily to increase the flow of traffic at the highest possible level of safety. However, little is known in numerical terms about the relationship between the actual road surface condition and the resultant safety or mobility level under winter conditions. This study will explore that relationship through the collection and analysis of data from two metropolitan areas. The first phase will be directed at the characteristics of vehicle accidents during snowstorms and associated road conditions. Traffic flow data will be introduced subsequently.
Sponsor: Transport Canada

Philip H. Jones, Department of Civil Engineering and Institute for Environmental Studies, University of Toronto; Vanolin F. Hurdle, Department of Civil Engineering, University of Toronto; and John Braaksma, Department of Civil Engineering, Carleton University.

Multinomial Probit Choice Models: A Methodological and Empirical Investigation The project is intended to investigate three major research issues associated with the development of multinomial probit choice models for transportation applications. These are -- the evaluation of currently available estimation techniques (Clark approximation, "separated split" procedure, Monte Carlo simulation, etc.); the improvement of the numerical procedures used in operationalizing these techniques; and the testing of probit models in a range of transportation problem applications (including their use in representing "taste variation" in the population, "measurement errors" in observed data, and situations in which the logit assumption of independent alternatives is violated). These investigations will involve both theoretical and empirical work, the latter using both hypothetical and real-world data.
Sponsor: Transport Canada

Eric J. Miller, Department of Civil Engineering, University of Toronto.

An Investigation of the Importance of Fleet Size in Improving the Utilization of Canadian Dry-bulk Vessels on the Great Lakes The proposed research will use linear programming to determine the optimal allocation of the fleet of Canadian dry-bulk Great Lakes vessels to the various loading ports so as to minimize the fleet's total empty sailing time. Empirical data, as to vessel movements for one navigation season, will be used to determine the ratio of actual total empty sailing time to the corresponding total optimal time for individual vessels and for groups of vessels. Investigations will first be made as to the extent to which such factors as the seasonability of movement for certain commodities affect these ratios. Further investigations will be made as to how these ratios for a fleet increase or decrease as the number of vessels in a fleet increase. These findings will indicate the extent to which operating efficiencies might be expected if fleets were merged or, at least, if several fleets could be dispatched together.
Sponsor: Transport Canada

Gordon C. Shaw and Wade D. Cook, Faculty of Administrative Studies, York University.

The Cost of Intercity Rail Passenger Services: Institutional and Technological Factors While almost all forms of intercity passenger transportation in Canada involve some degree of public subsidy, the level for rail services exceeds those of the other modes by an order of magnitude. Despite the emergence of VIA Rail as the new operating institutiton, and despite recent route structure rationalizations, rail passenger services continue to be a serious financial burden on the federal government.

Reasons for the poor financial performance are various: new modes have eroded the passenger train's traditional market, regulatory controls and labour practices have limited the ability of rail services to respond to this general market decline in a cost effective manner, and now under present arrangements the operating authority has very little direct control over the costs it incurs.

A clear understanding of these institutional barriers to improved efficiency is essential to the planning of an effective program of rail passenger R&D. Projects must be chosen which can assist in eliminating these barriers, or which can provide worthwhile benefits in spite of institutional factors. The overview which results from this project will also provide a valuable background against which major capital investment plans can be evaluated.

The study will examine the institutional and technological factors underlying the present cost structure of the industry in order to assess opportunities for improving the economics of current and proposed rail passenger services. In addition, the overall project objective will be to seek ways to improve the economic efficiency of intercity rail passenger transportation in Canada.
Sponsor: Transportation Development Centre

Richard M. Soberman and Adil Cubukgil, Joint Program in Transportation.

Mathematical Modelling of Gasoline Point-of-Sale Contingency Measures During an Energy Emergency The major purpose of this research is to develop and implement a disaggregate model of the impact of gasoline point-of-sale contingency measures. Even though Canadians have not experienced severe gasoline supply interruptions, legislation is in place which permits the government to impose conservation and management policies in the event of a shortage.

Although many such policies are possible and evaluations of their impacts can be completed, the purpose of this research is to evaluate only those policies that can be implemented at the point-of-sale of gasoline, for example, regulation on gas station hours, purchase requirements or limitations, flag schemes or pricing scenarios.

Modelling of this nature is justified because there are few, if any, Canadian models that are able to achieve the stated purposes. Few existing models have handled the issues at a disaggregate, decision-making level, and because there are newly available data on fuel consumption and automobile demand.

As the research is currently in its initial stages, the literature has been examined, and the intention is to develop two parallel models - one econometric model that relates fuel consumption to price, demand, and the degree of energy emergency, and a second deterministic discrete event simulation that will capture both consumer and supplier behavior, but be less sensitive to pricing issues.

Major data sources will be the Statistics Canada Passenger Car Fuel Consumption Survey, collected quarterly since late 1979, and a 1982 vehicle ownership and usage data set collected by the Joint Program. Once the models have been fully developed, the policies may be simulated to observe the possible effects of each form of contingency plan.
Sponsor: Energy, Mines and Resources Canada, External Research Program.

Robert A. Wolfe, Joint Program in Transportation

Disaggregate Modelling of Canadian Vehicle Ownership, Trip-Making and Fuel Usage: Phase II The second phase of this project involves refinement of the models developed during the first phase (see page 13). The resulting modelling system will then be used to explore a range of transportation policies concerning gasoline conservation, including fleet composition regulations, gasoline pricing strategies and public transit subsidy programs.
Sponsor: Energy, Mines and Resources Canada

Robert A. Wolfe, Joint Program in Transportation; Eric J. Miller, Department of Civil Engineering; and M.K. Berkowitz and Nancy Gallini, Institute for Policy Analysis, University of Toronto

GRANTS TO STUDENTS

Awarded prior to July 1, 1982

An Analysis of Snow Clearance Routes in the City of North York* The success of the operation of a public service -- i.e., snow removal, snow clearance, waste removal, street cleaning, and fire protection -- is determined by factors such as cost, quality, quantity, time, equity and efficiency of service. In addition, the route network, by which such services are delivered to the public, also lends a great deal to the success of these services. The research to be done will evaluate the snow clearance route network in the City of North York in order to see, by means of Shortest Path Algorithm, if the route operation can be made more efficient. Specifically, the present paths, length of route, time of route coverage, shape of route, and type of route will be analyzed. It is expected that different patterns of route coverage will yield more or less efficiency in the whole operation.

F. Aquila, Department of Geography, York University

The Air Transport Board, 1944-1967* In 1944 the Canadian federal government created the Air Transport Board, and gave it a mandate to regulate the air transport industry -- a mandate that lasted until 1967. During the Air Transport Board's reign, the Canadian air transport industry witnessed two significant developments, which have remained fundamental to the present industry. Firstly, the regional airline industry was spawned, and it matured at this time. And secondly, the mainline route was transformed into a duopoly in 1959, when Canadian Pacific Air was given a share of this market.

The study assesses the contribution of the Air Transport Board to transportation and regulatory development in Canada by addressing a number of thematic lines of inquiry, including: the issue of regulatory freedom from government, the idea that a regulatory agency may act as a forum of arbitration between publicly owned and privately owned enterprises, the extent to which regulation may foster administrative procedural efficiency, the degree of intermodal and intramodal competition within both the mainline and regional airline industries, entry controls in both these industries, and regulatory theory, especially as it pertains to air transport development.

W. Calleya-Cortis, Faculty of Administrative Studies, York University

The Effects of Schedule Policy on the Waiting Times of Transferring Passengers This research project is an investigation of how the waiting times of transferring transit passengers are affected by different service frequencies and scheduling policies. Scheduling methods, such as the timed-transfer concept and non-coordinated transit services, will be compared to

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*Indicates completion.

determine when they are appropriate for use. A survey will be designed to observe the arrival times of transferring passengers at transit centres under different service frequencies and scheduling policies. The data will be collected and statistically analyzed. A report summarizing the results and conclusions will be compiled.

J.W. Devney, Department of Civil Engineering, University of Toronto

Transportation in China* The development of its transportation network is a crucial part of China's drive to modernize by adopting western technology. Despite the implications that this has for the West, the state of knowledge on transportation in China is exceedingly poor. This is certainly true in a technical sense, and the lack of knowledge is often exacerbated by attitudes resulting from the great political, cultural and linguistic differences. Because the best references in this field often can only give estimates or are in error, this research will attempt to improve this situation by analysing the English and Chinese sources which the researcher compiled while working in this area for over two years, and further by reviewing the development of the past year.

J. Dion, Faculty of Environmental Studies, York University

Transit Priority Time Savings Evaluation* This study examines the effect of transit priority techniques on total trip time by applying a general reduction factor to empirical delay data for transit systems in Kitchener, Hamilton and Toronto.

Through observations of delays due to traffic congestion and traffic signals, the study provides evidence on the potential of priority schemes to reduce total trip time to/from the CBD. Observations are made in each of the three systems during peak-hour trips and the data and reduction calculations are used to reduce the existing isochrone map, providing graphic evidence of the priority measures' effect.

Further analysis compares the reduction in delays to passenger service time to show the measures' potential to increase parity between transit and the auto in the transportation network. Potential fuel savings at intersections are discussed.

D.J. Fletcher, Faculty of Environmental Studies, York University

Deriving Origin-Destination Information from Traffic Counts and Small Sample Surveys* Origin-destination flow tables are basic information for traffic management and transport planning tasks. While it is relatively simple and inexpensive to measure traffic volumes on the roads, information about the origins and destinations of trips is not easily recorded, and the process is expensive and time consuming. A procedure which estimates origin-destination flows from a cordon study has already been developed. The objectives of the proposed research are to develop a method to derive origin-destination estimates for an entire area based on collected traffic

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*Indicates completion.

counts and small sample surveys and to investigate the sample size required for these surveys.

I. Geva, Department of Civil Engineering, University of Toronto

Urban Transportation Planning in the USSR: A Policy Analysis* This project describes and discusses the present approach to the planning of urban transport systems in the USSR. The discussion draws mainly upon the evidence from Soviet publications concerned with the problems and policies of urban transportation.

The project is organized around the following facets of the subject: a brief outline of Soviet urban transport providing data on urban passenger transport growth, modal split, and the level of private car ownership and usage in cities; an identification of goals and objectives and their modification over time; an examination of current problems in Soviet urban transport planning; an evaluation of current policies dealing with public and private transport, and land-use patterns; and an organization of transportation planning. The study is concluded with a summary of the USSR's record in formulating a coherent and comprehensive package of policies for the planning of urban transportation.

G.I. Ozornoy, Program in Urban and Regional Planning, Department of Geography, University of Toronto

The Impact of Containerisation on the Spatial Characteristics of the Port Hinterlands of Halifax and Montreal* Technological developments in maritime transportation, namely the containerisation of general cargo, has led to a radical change in the port geography of eastern Canada. This research concentrates on the two major container ports of Halifax and Montreal. The increasing competition between these two ports is examined by investigating the spatial extent and commodity mix of their respective hinterlands. In doing so, the importance of the hinterland in determining port growth and development is assessed in comparison with other factors, such as the location of the port in relation to maritime space, the foreland and the physical and human characteristics of the port itself.

An assessment will be made of the implications of the proposed move by Dart Containerline from Halifax to Montreal, both in terms of the effects on the quality of service provided to the Maritimes and the changes in the hinterland infrastructure of Montreal. The research also examines this aspect of competition between Montreal and Halifax in terms of port investment stategies and the viability of the second container terminal at Halifax. Trade diversion between Canadian and U.S. ports is studied and the quantities and route characteristics of these flows are evaluated. Finally, an evaluation is made of the number of containers destined for the Halifax region as this has an important bearing on the economic impact of the container terminal.

A.O. Parry, Department of Geography, University of Toronto

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*Indicates completion.

Disaggregate Mode Choice Model for Metropolitan Toronto Home-Based Work Trips* The objective of this research is twofold: first, to develop a data set suitable for discrete choice modelling of modal choice for work trips in Metropolitan Toronto; and second, to use the data set to study modal choice characteristics for home-based work trips using a disaggregate multinomial logit model.

Due to data limitations, the study will be conducted in two stages. The first will study non-CBD destined work trips using data collected in the 1980 Metropolitan Toronto Employee Travel Survey. If time permits, the second stage of the research will study the mode-choice characteristics of CBD-destined work trips from data collected as part of the 1975 City of Toronto Central Area Parking and Loading Study.

First, a general mode-split model will be developed for non-CBD trip ends. Once a satisfactory base model has been developed the question of occupational differences in mode choice will be addressed. The predictive accuracy of the occupational models will be compared to that of the base model. Comparison of the estimated parameters for the occupation models will indicate if the occupation groups exhibit different characteristics in their choice between CBD and non-CBD destined work trips.

D.R. Ross, Department of Civil Engineering, University of Toronto

Awarded in the Spring of 1983

A Study of Factors in the Residential Location Choice The purpose of this research is to review and analyse the attitudes, perceptions and socio-demographic characteristics of urban dwellers in Canada using data from IBR's (Institute for Behavioural Research) Urban Concerns Survey. The analysis focuses on the correlations of these factors and the residential location decision of urban dwellers.

The aim of the research is to provide insights into the factors that influence the residential location in conjunction with the travel mode choice. Hopefully, this knowledge will be of use in the understanding of the behavioural assumptions in some current modelling techniques and will facilitate planners and decision-makers in the evaluation of urban projects.

D.J. Davies, Faculty of Environmental Studies, York University

An Application of a New Spatial Interaction Model to Work Trip Flows in Metropolitan Toronto The conventional spatial interaction model is mis-specified. The distance parameter contains both spatial structure and true distance effects and so is a biased estimate. To improve model predictability, a new spatial interaction model with explicit inclusion of spatial structure effect is employed to model 1971 Metropolitan Toronto journey-to-work data. It is expected that this new model will perform

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*Indicates completion.

better than the conventional formulation, giving spatial structure and friction of distance parameters worthy of interpretation. Should a satisfactory base model develop, it will be tested on different occupation groups. A comparison of the estimated parameters for the different occupation models will indicate if different occupation groups exhibit varying behaviour and/or perception towards distance as a factor of deterrence.

This research also carries a conditional attempt. If comparable data can be obtained for two different time periods, efforts will be extended to observe any behavioural or perceptual changes towards distance as an impedance factor over time or in the course of spatial structural changes.

L. Lo, Department of Geography, University of Toronto

Criteria for "Acceptable Risk" Determination in Transportation Policy Decision-Making The evaluation of "acceptable risk" decisions in the public policy-making process is a task that grows in importance with the introduction of even more complex forms of industrial technology. In practice, this evaluation must address questions of problem definition, public perception, and value consensus as much as methods of calculating event probabilities and impacts. The necessity of such forms of evaluation is nowhere more prevalent than in the transportation field where issues of occupational, passenger, and general public safety are an ever present concern. This project aims to develop criteria for the evaluation of "acceptable risk" choices in Canadian transportation policy decision-making. It does this by examining the case of hazardous cargo movement by rail, taking into account the interests of the industry, regulatory agencies, and an increasingly attentive public.

M.J. Norton, Department of Political Science, York University

Disaggregate Behavioural Modelling of Mode Choice In this paper, a set of multinomial logit models of work and non-work trip mode choices will be formulated, tested and validated. The trip travel modes to be modelled are: auto driver, auto passenger, bus, and walk. The data base for the calibration and testing of the mode choice models consists of 800 two-week travel diaries from randomly selected households in the Hamilton-Wentworth region, collected by McMaster University in 1978.

Variables reflecting the trip characteristics, the trip-maker characteristics, and the attributes of the transportation system will be included in the model formulation. The logit models developed will be calibrated using the maximum-likelihood estimation procedure.

W.R. Rhamey, Faculty of Environmental Studies, York University

The Influence of Eye Height on Vehicle Control* A moving base vehicle simulator, using computer-generated roadway imagery, will be used to study the ability of test subjects to perform driving tasks. Sets of experiments will be run that repeat a given task at different driver eye heights above the road. Conclusions will be drawn on the influence of eye heights on the driver's behaviour. In addition, it is hoped that the data collected will permit conclusions to be drawn on the validity of currently popular driver behaviour models at different eye heights, and on the impact of acceleration and vibration cues on driver behaviour.

R.W.R. Walker, Institute for Aerospace Studies, University of Toronto

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*Indicates completion.

EDUCATIONAL ACTIVITIES

Although the Joint Program functions primarily as a research centre and has no formal teaching responsibilities, it does support educational activities at the two universities in a variety of ways.

Opportunities for Graduate Students

The Joint Program provides financial assistance to graduate students who work as research assistants on specific projects funded out of either internal program grants or external contract research. In addition, the Joint Program offers a limited number of **Student Summer Grants** of up to $3500 on the basis of an internal competition. **Student Small Grants** are also available to cover incidental costs associated with thesis research and preparation. Applications for these small grants are made through the student's thesis supervisor.

Recipients of **Student Summer Grants** in 1982 were:

F. Aquila, Geography, York University
W. Calleya-Cortis, Administrative Studies, York University
J.W. Devney, Civil Engineering, University of Toronto
J. Dion, Environmental Studies, York University
D.J. Fletcher, Environmental Studies, York University
I. Geva, Civil Engineering, University of Toronto
G.I. Ozornoy, Geography, University of Toronto
D.R. Ross, Civil Engineering, University of Toronto

In 1983 the recipients were:

D.J. Davies, Environmental Studies, York University
L. Pui-Chun Lo, Geography, University of Toronto
B.I. May, Geography/Environmental Studies, University of Toronto
M.J. Norton, Political Science, York University
W.R. Rhamey, Environmental Studies, York University
R.W. Walker, Aerospace Science, University of Toronto

In addition, Canadian residents registered as graduate students in some area of transportation are eligible to apply for fellowships awarded annually by Transport Canada. These fellowships provide $9,500 for Master's level degree candidates and $10,000 for Ph.D. students.

During the 1982-83 academic session Transport Canada Fellowships were awarded to:

S. Brice, Geography, University of Toronto
J. Bryne, Applied Science, University of Toronto
W. Calleya-Cortis, Administrative Studies, York University
R. Long, Civil Engineering, University of Toronto
D. Munro, Civil Engineering, University of Toronto

R. Patrick, Mechanical Engineering, University of Toronto
D. Zingg, Aerospace Studies, University of Toronto

For the 1983-84 academic session, the recipients were:

E. Della Penna, Aerospace Studies, University of Toronto, Doctorate
R. Patrick, Mechanical Engineering, University of Toronto, Doctorate
D. Zingg, Aerospace Studies, University of Toronto, Doctorate Renewal

Canadian Transit Handbook, Second Edition

Editing of a series of working papers prepared under the auspices of the Transport Canada Surface Transportation Administration was initiated in June 1978 to produce a comprehensive manual, suitable for use as a text or reference for postgraduate courses in public transportation at Canadian universities. Additional material was also prepared for inclusion in the manual, which was published in August 1980. The Roads and Transportation Association of Canada and the Canadian Urban Transit Association have now adopted the Handbook as an official publication to be revised periodically with the assistance of the Joint Program. The second edition is scheduled for publication in late 1984.

Proceedings of the Eighth International Symposium on Transportation and Traffic Theory

The Eighth International Symposium on Transportation and Traffic Theory was held at the University of Toronto, June 24-26, 1981. Subsequently the Editors, Professors V. Hurdle, E. Hauer, and G. Steuart came to an agreement with the University of Toronto Press to publish the papers, and then the lengthy process of editing and correcting was begun. The final version of these papers is scheduled to appear in November 1983.

Graduate Studies in Transportation

A separate publication of the Joint Program lists courses and programs that have been identified by the department and faculty concerned as being directly related to transportation. A selected list of subjects is provided below as a sampling of the range of course offerings available in the two universities at both the graduate and undergraduate levels. A mechanism exists for graduate students in one university to register for particular credit courses in the other university.

UNIVERSITY OF TORONTO

AEROSPACE STUDIES (Graduate)

AER 502F	Stability and Control of Aircraft/J.DeLaurier
AER 1106S	Flight Transportation Technology/L.D. Reid
AER 1122S	Suspension Systems for Guided Vehicles/P.A. Sullivan
AER 2057H	Structural Qualification of Civil Aircraft/R.C. Tennyson

CIVIL ENGINEERING (Graduate)

CIV 530F	Traffic Engineering/V.F. Hurdle & P. Bunt
CIV 531F	Introduction to Transportation Planning/G.N. Steuart
CIV 532F	Highway and Airport Materials/M.M. Davis
CIV 1001F	Transportation Engineering/G.N. Steuart & V.F. Hurdle
CIV 1002S	Road Safety/E. Hauer & M.M. Davis
CIV 1033S	Analysis of Transport Operations/V.F. Hurdle
CIV 1035F	Transportation and Development/E.J. Miller
CIV 1036F	Functional Design and Management of Transport Operations/E. Hauer
CIV 1037S	Simulation in Civil Engineering/P.H. Byer
CIV 1038S	Transportation Demand Analysis/G.N. Steuart & E.J. Miller
CIV 1039F	Evaluation of Transportation Systems/P.H. Byer
CIV 1081S	Pavement Design/M.M. Davis
CIV 1088F	Highway Geometric Design/V.F. Hurdle
CIV 1091S	Characteristics of Public Transit Systems/ V.F. Hurdle

CIVIL ENGINEERING (Undergraduate)

CIV 330S	Transportation Systems/Transportation staff
CIV 432S	Highway Engineering/M.M. Davis
CIV 530F	Traffic Engineering/V.F. Hurdle
CIV 531F	Introduction to Transportation Planning/G.N. Steuart

MECHANICAL ENGINEERING (Graduate)

MEC 1020F&S	Guided Ground Vehicle Dynamics/staff

FORESTRY (Undergraduate)

FOR 357F	Forest Roads/D.V. Love & V.G. Smith

GEOGRAPHY (Graduate)

GGR 2603Y	Advanced Seminar in Transportation Geography

GEOGRAPHY, PROGRAM IN PLANNING (Graduate)

PLA 1901H	History of Planning/H. Blumenfeld
PLA 1902H	Metropolitan Planning/H. Blumenfeld
PLA 1001H	Introduction to Planning Theory & Practice/A. Roweis & G. Gad
PLA 1504H	Municipal Land Use Planning/S. Roweis
PLA 1701H	Regional Development/R. White

GEOGRAPHY (St. George Campus) (Undergraduate)
GGR 324S Geography of Urban and Regional Transportation/M. Gertler

LAW
LAW 337S Regulation/Prof. Trebilcock & Halpern

MANAGEMENT STUDIES (Graduate)
BUS 2405 Production and Distribution Systems
BUS 2508 Marketing and Distribution of Natural Resources

ECONOMICS (Graduate)
ECO 2605S Theory of Project Evaluation/A. Abouchar
ECO 3100F Economics of Transportation/A. Abouchar

YORK UNIVERSITY

ADMINISTRATIVE STUDIES (Graduate)
ECON 6120 Economic Effects of Government Regulation/ W.A. Jordan
MGTS 6600 Canadian Transportation Issues/G.C. Shaw

ECONOMICS (Graduate)
ECON 5340.03 Project Evaluation Techniques/J.C. Evans
ECON 5470.03 Urban Economics/G. Fallis
ECON 5480.03 Regional Economics/C. Paraskevopoulos

ENVIRONMENTAL STUDIES (Graduate)
ES 6010 Transportation Planning

GEOGRAPHY (Graduate)
GEOG 5310.03 Applied Transportation Geography/D. Freeman
GEOG 5340.03 Locational Analysis in Rural Geography/W.C. Found

POLITICAL SCIENCE (Graduate)
PS 5000.03 Urban Political Systems/M. Goldrick
PS 5650.03 The Canadian North/E. Dosman

PUBLICATIONS

Throughout the year, sponsored activities, research, courses, and general transportation information are published in one of six series. The following is a complete list, to date, of all available publications sold by means of written, prepaid request.

Research Report Series ISSN-0316-9456	PRICE
1 - **An Index of Railway Freight Rates by Region and by Rate Categories: 1954-1968** N.T. Jazairi, York University, October, 1971. 32 pp.	$ 4.00*
2 - **Modelling the Impact of Proposed Transportation Networks on the Toronto-Centred Region** I.J. Lord and J.R. Miron, University of Toronto, October, 1971. 30 pp.	3.50*
3 - **A New Approach to Network Generation and Map Representation: The Linear Case of the Location Allocation Problem** R.D. MacKinnon and G.M. Barber, University of Toronto, October, 1971. 24 pp.	3.50
4 - **Reflections on Citizen Involvement in Urban Transportation Planning: Towards a Positive Approach** W.A. Steger, President CONSAD Research Corporation, May, 1972 36 pp.	4.00*
5 - **A Review of Models of the Air Traffic Control Systems** N. Moray and L.D. Reid, University of Toronto, May 1972. 30 pp.	3.00*
6 - **V/STOL Community Annoyance Due to Noise: Proposed Indices and Levels** G.W. Johnston, University of Toronto, Institute for Aerospace Studies, May, 1972. 54 pp.	6.00*
7 - **Regional Transportation Systems and Population Impact Modelling: A Theoretical Development** J.R. Miron, University of Toronto, June 1972. 26 pp.	3.00*
8 - **A Conceptual Approach to Rural Land Use - Transportation Modelling in the Toronto Region** W.C. Found and C.D. Morley, York University, June 1972. 226 pp.	20.00*

*Only photocopies available, printed copies out of stock.

9 - **Platoon Profiles and Link Delay for Optimal Co-ordination of Traffic Signals on Arterial Streets** 5.50*
N. Gartner, University of Toronto, October 1972. 52 pp.

10 - **The Impact of Expressways on Adjacent Apartments: A Case Study of Metropolitan Toronto** 1.50*
J.R. Hitchcock and A. Waterhouse, University of Toronto, February, 1973. 140 pp.

11 - **The Impact of Urban Transportation Investment on Land Value** 10.00*
D.N. Dewees, University of Toronto, February, 1973 87 pp.

12 - **Transportation - A Design Study of a Probable Future Mechanical Storage Drive System** 2.50
R.C. Flanagan and P.R. Palmer, University of Toronto, June, 1973. 139 pp.

13 - **Annoyance Measurements Related to Urban Traffic Noise Exposure** 4.50*
G.W. Johnston and R. Carothers, University of Toronto, August, 1974. 44 pp.

14 - **Some Transportation Aspects of a Sports Stadium** 2.00
W.J. Sproule, University of Toronto, December, 1973. 110 pp.

15 - **An Annotated Bibliography on Planning for Pedestrians** 2.00*
E. Rodgers, University of Toronto, February, 1974. 29 pp.

16 - **Stabilization Policies: Government Expenditures on Transport in Canada and Some Lessons from European Experience** 4.00*
J. Beare, York University, February, 1974. 37 pp.

17 - **An Interactive Transportation Gaming Model for Metropolitan Toronto: Progress Report** 1.75
R.G. Rice, University of Toronto, W.C. Found, York University, and S.F. Gribble, Graduate Student, University of Toronto, April 1974. 79 pp.

18 - **Transportation Planning Techniques: Problems and Prospects: Progress Report** 1.50*
H. Schuster, Economic Develpment Institute of the International Bank for Reconstruction and Development, Washington, D.C. May, 1974. 15 pp.

19 - **The Use of Criteria Weights in Rank Ordering Techniques of Project Evaluation** 2.00*
D.M. Nowlan, University of Toronto, July, 1974. 20 pp.

20 - **The Great Canadian Transportation Information Dilemma** 9.00*
M.H. Lovelock, Canadian Transport Commission and A.L. Poole, Joint Program in Transportation, August, 1974. 89 pp.

21 -	**Capacity of a Signalized Intersection** T.A. Lambe, University of Toronto, October, 1974. 13 pp.	1.50
22 -	**Multiple Queues of Aircraft Under Time-Dependent Conditions: Policy Options for Toronto International Airport** J.H. Bookbinder and H. Luthra, University of Toronto, October, 1974. 27 pp.	3.00
23 -	**Strategy and Tactics for Public Participation in Transportation Planning In North America** B. Wellman, University of Toronto, November, 1974. 35 pp.	3.50*
24 -	**Urban Traffic Noise Annoyance Measurements and Derived Indices** G.W. Johnston and R. Carothers, University of Toronto, December, 1974. 47 pp.	2.25
25 -	**Effects of Changes in Parking Prices and Parking Restrictions on Urban Transport Demands and Congestion Levels** D.W. Gillen, University of Toronto, February, 1975. 52 pp.	5.00*
26 -	**Some Predatory Practices Under Government Regulation** W.A. Jordan, York University, January, 1974. 61 pp.	1.75
27 -	**Land Rent, Land Use and Transport: A Study in the Geographical Foundations of Political Economy** A.J. Scott, University of Toronto, May, 1975. 39 pp.	4.00*
28 -	**Transport, Residential Space and the Urbanization Process** A.J. Scott, University of Toronto, May 1975. 40 pp.	4.00*
29 -	**The Canadian Lake Shipping Industry Today** H.J. Darling, Transportation Economist and G.C. Shaw, York University, August, 1975. 88 pp.	5.00
30 -	**Social Aspects of Urban Transportation: A Bibliographic Review** F. Frisken and G. Emby, York University, September, 1975. 279 pp.	4.50
31 -	**Innovation in Transit in Medium Size Canadian Cities** D. Levy, Graduate Student, Faculty of Environmental Studies, York University, January, 1976. 75 pp.	3.50
32 -	**An Interactive Model for Urban Transportation Decision-Making** M.J.M. Posner, University of Toronto, February, 1976. 24 pp.	3.75
33 -	**A Study of the Effects of a Change in the Price of Transport Services on General Prices in the Canadian Economy** J. B. Beare, York University, April, 1976. 26 pp.	3.75
34 -	**Signal Priority for Transit Vehicles** D.W. Allen, Graduate Student, Dept. of Civil Engineering, University of Toronto, May 1976. 79 pp.	4.00

35 - **JPTRS - Joint Program in Transportation Retrieval System** 4.50
C. Pennell, J. Shipman and A.L. Poole, Joint Program in Transportation Information Services, May, 1976. 125 pp.

36 - **Investment in Residential Construction in Metropolitan Toronto 1960 to 1974** 3.75
R.E. Newby, Graduate Student, Dept. of Political Economy, University of Toronto, June, 1976. 31 pp.

37 - **Canadian Great Lakes Shipping: An Annotated Bibliography** 4.00
S.S. Patterson, Research Librarian, National Transportation Policy Project Group on Canadian Marine Transportation, August, 1976. 72 pp.

38 - **The Effect of Alternative Urban Forms on Two-Mode Transportation System Requirements** 4.00
R.G. Rice, Assistant Professor, Dept. of Civil Engineering, University of Toronto, March, 1977. 54 pp.

39 - **The Transit Systems of Small Cities in Ontario** 5.00
M.H. Perera, Graduate Student, Dept. of Civil Engineering, University of Toronto, April, 1977. 99 pp.

40 - **Metrans: Manual for a Simulation Game for Transportation/Land-Use Planning in Metropolitan Toronto** 4.00
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BELL, D.V.J.
Professor of Political Science and
Dean of Graduate Studies
York University

1. **Power, Influence and Authority: An Essay in Political Linguistics,** New York: Oxford University Press, pp. xii & 1-131, 1975.

2. "Foreword" to Edgar J. Dosman, **The National Interest.** Toronto: McClelland and Stewart. Canada in Transition Series, 1975.

3. "Regionalism in the Canadian Community." Lead article in section on Regionalism in Paul Fox (ed.), **Politics Canada.** 4th ed. Toronto: McGraw-Hill Ryerson, pp. 79-89, 1977.

4. "Political Linguistics and Political Education." Lead article in **Teaching Politics,** September, pp. 219-244, 1977.

5. **The Roots of Disunity: Canadian Political Culture** (with Lorne J. Tepperman). Toronto: McClelland and Stewart. Canada in Transition Series, pp. vii & 1-262, 1979.

6. "Language and International Politics." Guest Editor. **International Interactions,** Vol. 6, No. 3, pp. 185-321, 1979.

7. "Introduction" to ibid., pp. 185-191, 1979.

8. "Political Linguistics and Events Research." Ibid., pp. 193-207,1979.

9. "The Canadian Mass Media and the Reporting of Transportation Policy" (with Frederick J. Fletcher). **Transportation Research Forum** XX, 1, 1979, pp. 42-47, 1979.

10. "Foreword" to John Roberts and Larry Pratt, **Prairie Capitalism: Power and Influence in the New West** (with Edgar J.E. Dosman). Toronto: McClelland and Stewart. Canada in Transition Series, 1979.

11. "Political Factors Affecting the Mission of the Addiction Research Foundation" (mimeo 62 pages), 1980.

12. "Foreword" to H. Darling, **The Politics of Freight Rates,** Toronto: McClelland and Stewart (with Edgar Dosman), 1980.

13. "Alcohol: Public Education and Social Policy" (with M. Goodstadt et al.) Addiction Research Foundation. 234 pp, 1981.

14. Contributions to four chapters of a report on the "Press and Politics" (with F. Fletcher) commissioned by the Royal Commission on Concentration in the Newspaper Industry. (Kent Commission) 1981.

15. "Social Change and the Political Culture of Problem Points in Advanced Industrial Societies: The Case of Canada," in G. Dlugos et al (eds.), **Management Under Differing Value Systems**. Berlin: De Gruyter, 1981, pp. 109-126.

16. "Canadian Political Culture," Chapter in Michael Whittington and Glen Williams (eds.), **Canadian Politics in the 1980's**. Toronto: Methuen, 1981, pp. 108-125.

17. "Parliament and Politics: 1980," Section in R.B. Byers (ed.), **Canadian Annual Review**. Toronto: University of Toronto Press, 1982 (with Donald C. Wallace), pp. 5-120.

18. "Foreword" to Glen Williams, **Not for Export**. Toronto: McClelland & Stewart, 1983 (with Edgar J.E. Dosman).

19. "Regionalism" in M. Rosenberg et al. eds., **An Introduction to Sociology**. Toronto: Methuen, 1983.

20. "Political Linguistics and the Study of Power." Conference paper presented to the International Studies Association, Toronto, February, 1976.

21. "Political Linguistics and Political Education." Conference paper presented to the International Political Science Association, Edinburgh, August, 1976.

22. "Political Linguistics and Events Research." Paper presented at the Peace Science Society -- Southern Section Conference, Boca Raton, Florida, April 1978.

23. "The Mass Media and the Reporting of Transportation Policy" (with Frederick J. Fletcher). Paper presented to the Fourteenth Annual Meeting, Canadian Transportation Research Forum, June, 1979. (One of three papers selected to be re-presented at the Transportation Research Forum, Chicago, October, 1979.)

24. "Alcohol in Ontario: Its Costs and Benefits." Paper prepared under contract to Ontario Ministry of Health, September, 1980.

25. "Political Linguistics." Paper presented to Applied Linguistics Research Working Group (A.L.R.W.G.) Glendon College, March, 1981.

26. "New Directions for Political Linguistics." Paper presented to the American Political Science Association Annual Meeting, New York, September, 1981.

27. "A Framework for the Analysis of Integration and Fragmentation in Canada." Paper presented to Conference on "Integration and Fragmentation in North America." Carleton University, March 1982.

28. "The Theories of Louis Hartz." Roundtable presentation to the Canadian Political Science Association Annual Meeting, Ottawa, June 1982.

29. "The Political Culture of Problem-Posing and the Study of Public Policy." Paper presented to Conference on "Problem Recognition and Setting a Policy Agenda," Carleton University, April 1983.

BIEMILLER, A.J.
Institute of Child Study
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1. "Estimated Annual Costs of Urban Transit Routes." Published in **Proceedings, 21st Annual Meeting of Transportation Research Forum**, Richard B. Cross Co., Oxford, Indiana: 1980, pp 568-577.

BOOKBINDER, J.H.
Department of Management Sciences
University of Waterloo

1. "Multiple Queues of Aircraft under Time-Dependent Conditions," paper presented at **The Institute of Management Sciences**, Philadelphia: March, 1976.

2. "The Dynamic Transportation Problem: A Survey," Naval Research Logistics Quarterly, Vol. 27, 1980, pp. .

BORINS, S.F.
Faculty of Administrative Studies
York University

1. "The Effects of Non-Optimal Pricing and Investment Policies for Transportation Facilities," **Transportation Research** XVI B, January 1982, 17-29.

2. "The Effect of Pricing Policy on the Optimum Timing of Investments in Transport Facilities," **Journal of Transport Economics and Policy** XV, May 1981, 121-134.

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4. **The Language of the Skies: The Bilingual Air Traffic Control Conflict in Canada.** Kingston: The Institute of Public Administration of Canada, 1983.

5. "Climbing Along a Plateau: The Effects of Economically Non-Optimal Transportation Pricing and Investment Policies," to be published in Proceedings of the Fourth World Conference on Transport Research, Hamburg, West Germany, April 26-29, 1983.

BYER, P.H.
Department of Civil Engineering
University of Toronto

1. with A. Bacchus, "Inferring the Value of Life from Public Safety Investments," **Journal of Transport Economics and Policy**, under review.

CARTWRIGHT, T.
Faculty of Environmental Studies
York University

1. **Canadian Aircraft Market Summary**, monthly bulletin of aircraft prices and sales, numbers 1-31 (September 1980 to March 1982), still in progress.

2. **Annual Blue Book of Aircraft Prices in Canada**, annual summary of aircraft prices and sales. Two issues (1980 and 1981). Agreement signed with Maclean-Hunter for publication of 1982 edition.

3. Various articles for **Airborne** magazine, a Canadian trade publication.

CHERCHAS, D.B.
Department of Mechanical Engineering
University of British Columbia

1. with Jackson, J., "Dynamic Analysis of a Flexible Vehicle-Flexible Guideway System with Random Guideway Roughness Input," **High Speed Ground Transport, Jour.**, Vol. II, No. 1, pp. 19-51, May 1977.

2. "A Dynamics Simulation for a High Speed Magnetically Levitated Guided Ground Vehicle," **ASME Journal of Dynamic Systems Measurement and Control**, Vol. 101, pp. 223-229, Sept. 1979.

3. "Determination of Railway Wheel Climb Probability based on the Derailment Coefficient," **Journal of the Franklin Inst.**, Vol. 322, No. 1, pp. 31-40, July 1981.

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CUBUKGIL, A.
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DAY, GEORGE S.
Faculty of Management Studies
University of Toronto

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DeLAURIER, J.D.
Institute for Aerospace Studies
University of Toronto

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DEWEES, D.
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University of Toronto

1. "Simulations of Traffic Congestion in Toronto," **Transportation Research**, 12, June 1978, pp. 153-161.

2. "Estimating the Time Costs of Highway Congestion," **Econometrica**, 47, November, 1979, pp. 1499-1512.

DOOLEY, J.E.
Faculty of Management Studies
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DOSMAN, E.J.
Department of Political Science
York University

1. **The National Interest: The Politics of Northern Development**, McClelland and Stewart, 1975.

2. **The Arctic in Question**, Oxford University Press, 1976.

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4. "The Marine Mode: Oil, Gas and Arctic Shipping," **Alternatives**, Vol. 7, No. 3, 1978.

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FLETCHER, F.J.
Political Science
York University

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